EFFICACY OF PLACEMENT OF ALDICARB FOR THE CONTROL OF STUBBY ROOT NEMATODES AND CORKY RING SPOT DISEASE OF POTATO

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Summary. Two experiments were conducted in a potato field to study the efficacy of placements of aldicarb for the control of corky ring spot disease and yield of potato. In the first experiment different placements of aldicarb significantly increased total and marketable yield of potato compared to the untreated check. In the second experiment aldicarb applied in the furrow at planting, modified in the furrow at planting or in the furrow at planting, in combination with foliar applications of oxamyl, resulted in the lowest incidence of corky ringspot disease and had the highest total and marketable yields. Aldicarb applied as front of the planter shoe at planting or imidacloprid applied in furrow at planting were less effective than other placements of aldicarb. Yield loss to stubby root nematodes, *Paratrichodorus* spp., due to corky ringspot incidence ranged from 6 to 55%, and resulted in significant differences in total and marketable yields adjusted for corky ringspot disease.

Stubby-root nematodes (*Paratrichodorus* spp. and *Trichodorus* spp.) are of concern to potato growers in Idaho because they are vectors of tobacco rattle tobravirus (TRV), which causes corky ringspot (CRS) disease. They transmit TRV directly to potato tubers during tuberization to cause CRS symptoms (Weingartner *et al.*, 1975). Virus infection blemishes tubers (Hooker, 1981) and renders them unmarketable. This disease is of major concern to potato growers in the Pacific Northwest as tuber injury of 5-10% may result in rejection of the crop harvest of an entire field (Williams *et al.*, 1996). Distribution of *P. allius* in the United States is presently limited to Oregon, Washington and California (Norton, 1984) while *P. minor* and *P. porosus* are common in Idaho and Eastern Oregon (Hafez *et al.*, 1992).

MATERIALS AND METHODS

Two experiments were undertaken to evaluate the efficacy of placement of aldicarb along with oxamyl or imidacloprid on corky ring spot disease and yield of potato. They were in a commercial crop of potato, *Solanum tuberosum* L., cv. Russet Burbank near Egin, Fremont County, Idaho, USA. The experimental design was a randomized block with four treatments and five replications of each. Plots of 30.4 m length and four rows wide were prepared. Cut seed pieces of tubers were machine planted at 25 cm drop spacing. Aldicarb granules (15G) were placed as a narrow band at the rate of 22.5 kg/ha (c.p.) in the furrow at planting, or the granules were placed behind the planter shoe but in front of the closing discs in a 2.5–3 cm band, or the granules were placed in front of the planter shoe in 2.5–3 cm band. Untreated check plots were included. Prior to planting, soil samples (0-30 cm and 30-60 cm depths) were collected from each plot to determine population densities of *Paratrichodorus* sp., after extraction using a decanting and sieving technique followed by the centrifugal floatation method (Caveness and Jensen, 1955).

In the second experiment, in addition to aldicarb, imidacloprid L 21.4 % (1.4 l/ha c.p.) was applied in the furrow at planting using flat fan nozzles mounted just behind the planter shoe. Oxamyl L 24% (7 l/ha, c.p.), was applied twice as a foliar spray using a hand held boom sprayer with flat fan nozzles. First when the potato plants were 2–2.5 cm tall (29 June) and secondly at row closure (20 July) to plots previously treated with aldicarb 15G (22.5 kg/ha) in the furrow at planting. Untreated check plots were included.

Irrigation, fertilization and pest control were carried out according to local recommended practices. At maturity of the crop, the central 7.6 m of the two middle rows in each plot were harvested and total and marketable yields were recorded. Fifty percent of the tubers from each market grade were mechanically sliced lengthwise in _ inch thick slices and examined for internal symptoms of corky ringspot disease. The total number of clean and infected tubers was recorded for each sample, and the loss attributed to corky ringspot disease was calculated.

RESULTS AND DISCUSSION

In the first experiment, application of aldicarb significantly increased total and marketable yield of potato compared to the untreated check (Table I). Incidence of corky ringspot disease in the untreated check resulted in nearly a 4% yield loss. Comparison of the untreated check with the three aldicarb treatments indicate a statis-

Table I. Efficacy of aldicarb in a potato field on the control of stubby root nematode and yield parameters of potato (Experiment I).

Treatment	Stubby root nematode population (in 500 cc of soil)		Yield (q/ha)		Yield loss to stubby root nematode (%)		Yield adjusted for corky ringspot disease (q/ha)	
	0-30 cm	30-60 cm	Total	Market	Total	Market	Total	Market
Untreated check	162	248	37.2 b	26.9 b	0.4	0.4	35.7 b	25.8 b
Aldicarb (in the furrow at planting)	132	120	45.7 a	35.2 a	0.1	0.1	45.2 a	34.8 a
Aldicarb (modified in the furrow at planting)	106	174	43.9 a	34.0 a	0.1	0.1	43.6 a	33.8 a
Aldicarb (front of the planter shoe at planting)	80	270	46.8 a	35.8 a	0.1	0.1	46.5 a	35.6 a
LSD (P=0.05)	NS	NS	5.2	5.2	NS	NS	5.5	5.5

Means followed by the same letter within a column are not significantly different at P = 0.05. q = 100 kg.

Table II. Efficacy of aldicarb in a potato field on the control of stubby root nematode and yield parameters of potato (Experiment II).

Treatment and rate/ha	Stubby root nematode population (in 500 cc of soil) at 0-60 cm depth	Yield (q/ha)		Yield loss to corky ringspot disease (%)		Yield adjusted for corky ringspot disease (q/ha)	
		Total	Market	Total	Market	Total	Market
Untreated check	187	45.6	30.6	6.0 a	6.2 a	21.5 c	14.4 d
Aldicarb 15G (in the furrow at planting)	165	45.9	32.7	1.5 c	1.5 bc	40.1 ab	28.2 abc
Aldicarb 15G (modified in the furrow at planting)	153	46.3	33.3	0.8 c	0.8 c	43.0 ab	31.0 ab
Aldicarb 15G (front of the planter shoe at planting)	154	47.6	34.4	3.5 ab	3.5 b	32.3 bc	24.0 bc
Aldicarb 15G (in the furrow at planting) + Oxamyl L	184	47.4	33.8	0.7 c	0.7 c	44.7 a	31.8 a
Imidacloprid (in the furrow at planting)	151	45.9	31.6	3.4 b	3.6 b	32.3 bc	21.3 cd
LSD (P=0.05)	NS	NS	NS	2.5	2.6	11.6	7.5

Means followed by the same letter within a column are not significantly different at P = 0.05. q = 100 kg.

tically significant loss. Adjustment of the total and marketable yields for losses attributed to corky ringspot disease indicated that application of aldicarb was advantageous. There was no evidence to suggest that a particular placement method of aldicarb relative to the seed tuber piece improved efficacy. All aldicarb treatments performed similarly. Pretreatment population levels of stubby root nematodes were not significantly different among treatments when averaged for the two sampling depths. Stubby root nematode population density among treatments ranged from 80 to 162/500 cc soil at 0-30 cm depth and 120 to 270/500 cc at 30-60 cm depth.

In the second experiment, aldicarb applied alone in the furrow at planting, modified in the furrow at planting, or in the furrow at planting, in combination with foliar application of oxamyl, significantly reduced the total and marketable yield loss of potato to corky ring spot disease when compared to other treatments. However, no significant difference in total and marketable yield was observed in any of the other treatments. Total and marketable yield adjusted to corky ring spot disease was more in the plots treated with the combination of aldicarb and oxamyl. Overman and Price (1983) reported that single weekly injection of oxamyl into the irrigation water reduced stubby-root nematode populations and increased marketable yield of chrysanthemum flower stems. Further, aldicarb applied as front of the shoe at planting or imidacloprid applied in the furrow

at planting were less effective than other placements of aldicarb. Yield loss to stubby root nematode due to corky ringspot incidence ranged from 6 to 55%, and resulted in significant differences in total and marketable yields adjusted for corky ringspot disease.

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Accepted for publication on 15 July 2002.